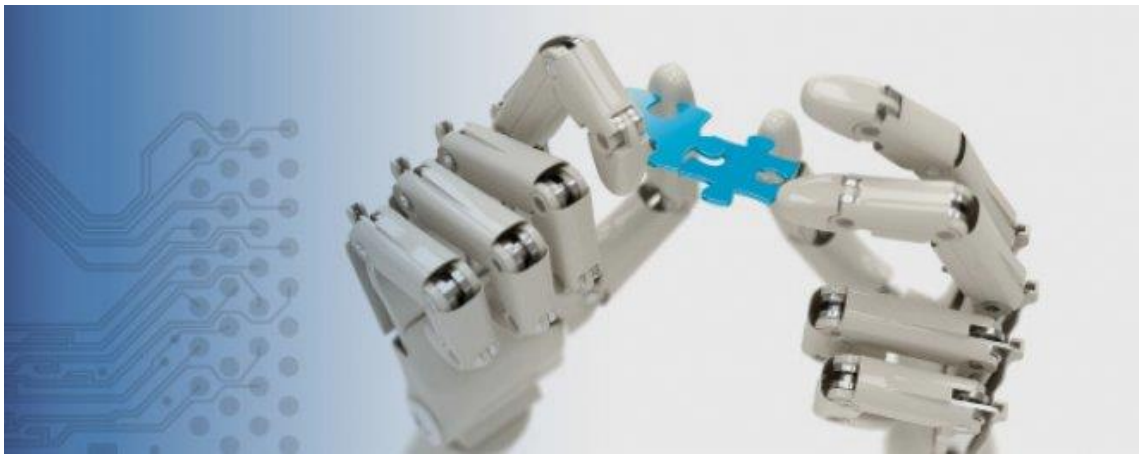
ROBOTICS MASTER

Universitat de Vic



Subject: Robotics Integration

Unit: 1_A: Introduction

Exercixse 1.1: Robotic system to do Human Tracking

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Exercise 1.1

GOAL:

Develop a robotic system to point a camera to a ball or face target.

Two modes of operation:

Automatic: No human intervention

Teleoperated: with flexi sensors in the hand

ASSIGNMENT:

- Draw a device connection diagram
- Draw a kinematic frame sketch
- Draw a process diagram of the sw components involved
- Draw a software dependency diagram of the sw components involved

DELIVERY:

- **Before** October, Friday 23rd
- pdf, png, jpg files through moodle.

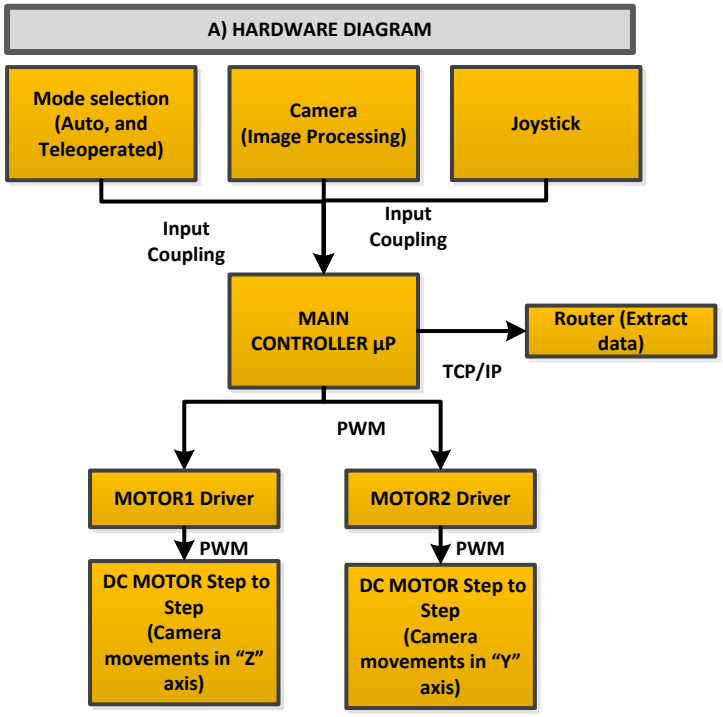
UVIC UNIVERSITAT DE VIC UNIVERSITAT CENTRAL DE CATALUNYA | eurecat | Master on Robotics Postgraduate in Industrial Robotics / Mobile Robotics | Andreu Corominas Murtra [www.beta-robots.com] 1A. Introduction | 9

Develop a robotic system to point a camera to a ball or face target.

Two modes of operation:

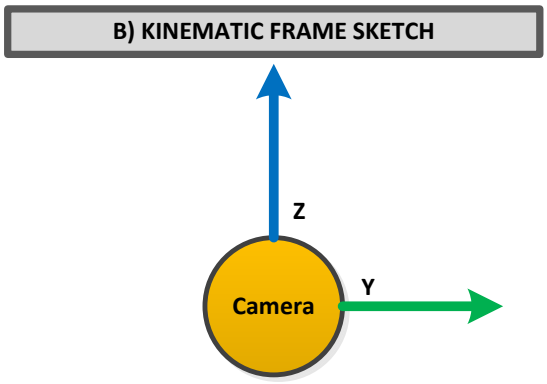
- Automatic: No human intervention
- Teleoperated: with flexi sensors in the hand

A. Draw a device connection diagram



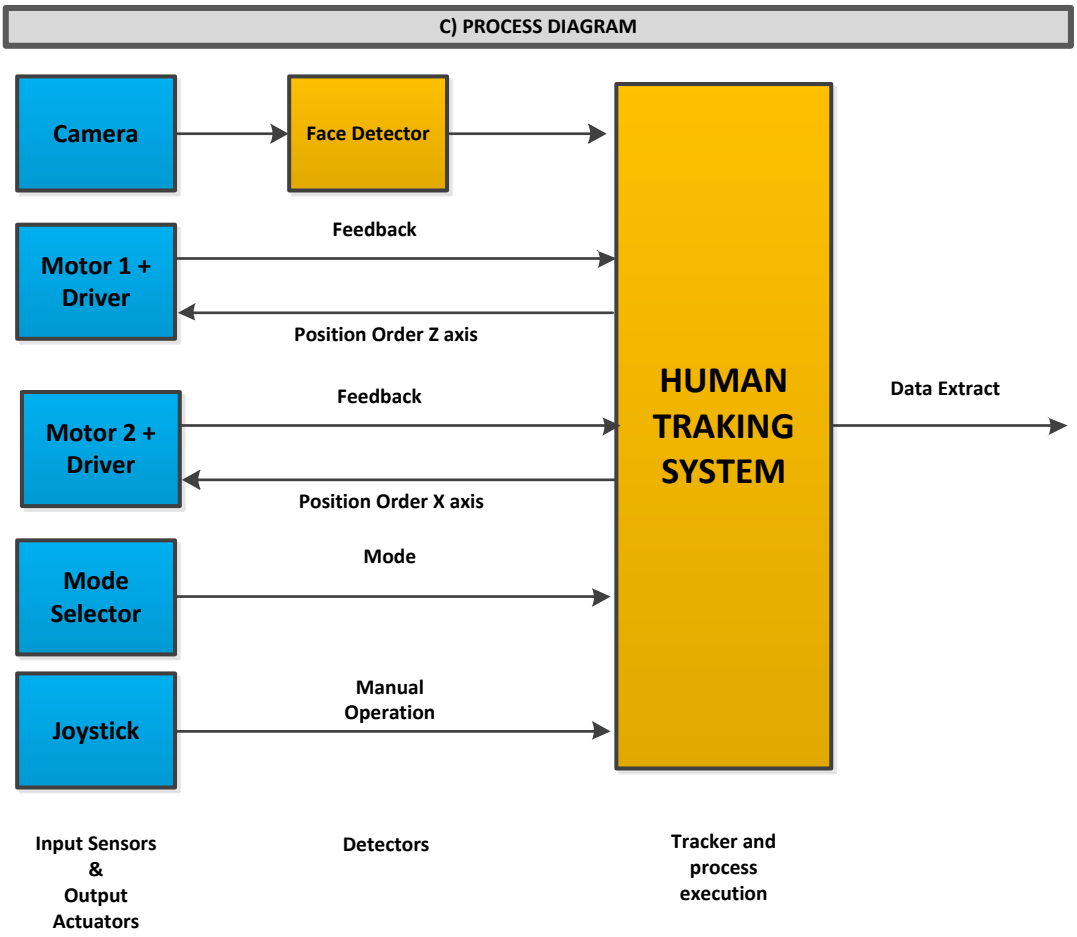
Camera system is connected to the µP with Input coupling. Mode selector has two modes to operate the system in Automatic Tracking or Teleoperated operation, also is connected to the µP using Input coupling.
The main controller process the image of the camera, with advanced algorithms recognize the face of the human, fix the track and order the movements to the Motors to follow the human. Step to Step Motors are controlled by a driver to give them the needed power. These movements of the camera are executed in the Z and Y axis.
Motors give to the main controller a Feedback relating his position and the executed movements.
The main controller also is connected to a Router in TCP/IP connection to send data to other systems, such as the processed image, movements of the camera, etc.
Face recognition algorithms are deactivated when Teleoperated mode is activated. Then manual inputs of human operator are executed via a Joystick.

B. Draw a kinematic frame sketch

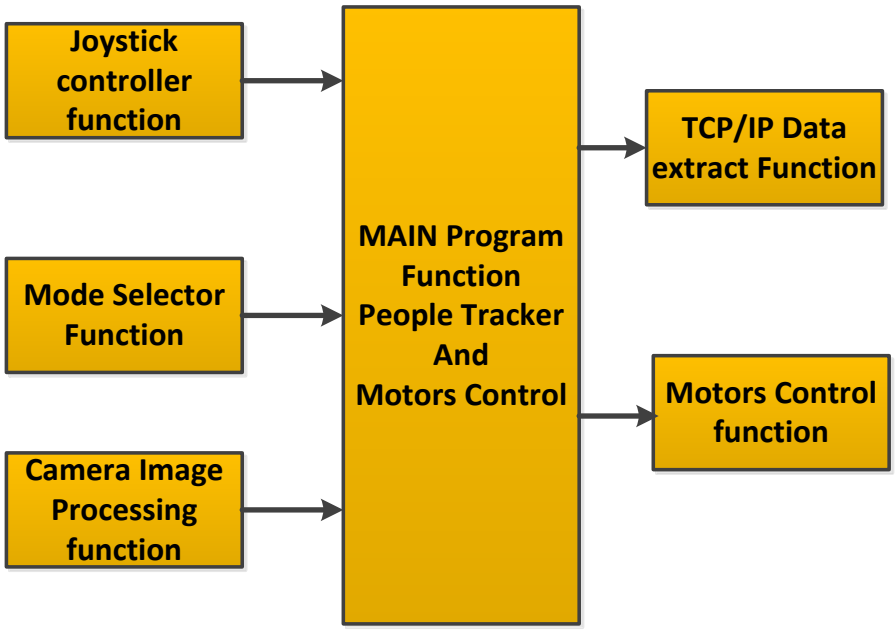


Camera movements are executed in Z and Y axis using two motors. Two have movements in X axis is needed translation of the camera system.

C. Draw a process diagram of the sw components involved



D. Draw a software dependency diagram of the sw components involved



Software program is modularly structured. A main function call to other five functions:

- Joystick Controller Function

  Process the orders received by the Joystick. Outputs of function are the required direction of movement.

- Mode Selector Function

  Process the selection of Automatic and Teleoperated Function. Outputs are two bits which activate/deactivate both modes

- Camera Image Processing function

  Process the image received by the camera. With advanced ROS algorithms and using OPENCV function track the face and movements of the operator. Outputs are the required direction of movement according to human displacement

- Motors Control Function

  Controls the motors using drivers which amplifies current to give power to the motors and execute step to step orders in order to have an accurate movements

- TCP/IP Data extract Function

  Prepare data to be sent by fieldbus connection TCP/IP